COMPARISON OF RECTAL AND AXILLARY TEMPERATURES OF ISA BROWN AND HARCO BLACK LAYERS FED DIFFERENT LEVELS OF DIETARY ACETYLSALCYLIC ACID (ASA)

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ABSTRACT
The experiment was performed to compare the axillary and rectal temperature of two breeds of commercial layers: Harco Black and Isa Brown in their early stage of production. Four diets with different acetyl salicylic acid (ASA) levels of 0.00% which is the control diet (T1), 0.025% (T2), 0.050% (T3), and 0.075% (T4) were fed to the birds throughout the eight weeks of the study.
The evening rectal temperature and evening axillary temperature were significantly different ($P<0.05$) among treatments. Layers fed diet 0.075% ASA had the lowest rectal temperature and those fed the control diet had the highest rectal and axillary temperature. Also, there was a decrease in the rectal temperature as the level of ASA in the diet increased. In conclusion, 0.075% of ASA in layers diets would obviate the ill effects of heat stress through its anti-pyretic effects. Comparatively, the rectal temperature proved to be the more sensitive method of determining the core body temperature which fluctuates in consonance with the ambient temperature. Also, the Isa Brown breed could tolerate more heat stress than the Harco Black.
Keywords: Ambient temperature, heat stress, Isa Brown, layers, Harco Black, rectal temperature.

INTRODUCTION
In hot climates, periods of high temperatures can impact negatively on the health and performance of domestic animals. Poultry farming is no exception and the effect of stress caused by elevated temperatures can result in heavy economic losses from increased mortality and reduced productivity (St-Pierre *et al.*, 2003). For birds to perform at their optimum capacity they need to among other factors be in homeostasis with their environment through the maintenance of thermo-balance. Thermo-balance is the equilibrium between the heat produced and the heat given out by living organisms, and this is at its maximal physiological level within the thermoneutral range of any given species. Birds, like mammals are homeothermic, they produce heat to maintain a relatively constant body temperature and may permit certain variations within their temperature range without significant physiological imbalance (St-Pierre *et al.*, 2003).
Several intervention strategies have been canvassed at reducing heat load in livestock among which is the use of acetylsalicylic acid (ASA) or Aspirin. ASA is a well known antipyretic drug (Weissmann and Jack, 1997) reputed for its inhibition of prostaglandin synthesis thereby helping to reset the "hypothalamic thermostat". It has been demonstrated that feeding ASA to chickens during heat stress lowers body temperature. McDaniel and Parker (2004) found that feeding 0.05% ASA to broilers decreased body temperature by as much as 0.3°C when birds were exposed to 29°C. McDaniel *et al.* (1993) found that the feeding layer breeder hens 0.2% ASA did not alter fertility whereas 4% decreased fertility. The correct dietary level of ASA may also decrease the body temperature of heat stressed broiler breeders. In addition, it appears that feeding ASA to hens during heat stress conditions improves egg quality and egg production (Oluyemi and Adebayo, 1979).
Commercial laying birds are one of the farm animals that are mostly exposed to the exigencies of environmental variables like humidity, draught, solar radiation and high ambient temperature. Most commercial laying birds are often kept for more than 72 weeks in lay before being disposed off as spent layers during which time, they are kept under the direct assault of these environmental variables. The loss in production, efficiency and physiological conditions of livestock under such inclement environment is better imagined than experienced.

There is dearth of information of the relative tolerance of our commercial layers' breeds to heat stress more so under the ameliorative effect of dietary supplementation of acetyl salicylic acid (ASA). Therefore this study sought to compare the rectal and axillary temperature of Isa Brown and Harco Black breeds of commercial layers with a view to determining their relative tolerance to heat stress under the ameliorative effect of graded levels of dietary ASA.

MATERIALS AND METHODS

Experimental site: The experiment was carried out at the students' project building of the Livestock section of Teaching and Research Farm of the Federal University of Technology, Akure, Ondo State, Nigeria. Akure is located on latitude 7°18"N and longitude 5°10"E. The site is within the hot, wet equatorial climate with high rainfall (1,500mm) and relative humidity (well above 75%) all the year round with a mean annual temperature of about 27°C

Experimental Materials: One hundred and ninety-two point-of-lay birds were purchased from a reliable source comprising 96 Harco Black and 96 Isa Brown breeds respectively. Four experimental diets were formulated to meet the nutrient requirement of layers in which Aspirin, the test ingredient was added at 0.00%, 0.025%, 0.050%, and 0.075% of the diets respectively. The 0.00% diet (T1) served as the control while the other three diets were assigned T2, T3, and T4 respectively. Each treatment consisted of four replicates in which the two breeds of birds were used at 12 birds per replicate and 48 birds per treatment. The experiment was carried out over a period of 8 weeks. The hens were fed with the experimental diets according to their respective treatments until the end of the experiment. Table 1 gives the gross composition of the experimental diets.

Managements Practices: Medications and vaccinations were administered as at when due and spent litter materials were removed every week. The birds were fed *ad-libitum* for 12hours daylight period.

Data Collection and Analysis: The ambient temperature was taken with a mecury-in-glass thermometer while rectal temperature and the axillary temperatures were taken with a digital thermometer model KD-2201, manufactured by K-Jump Health Co., Ltd. All these parameters were measured three times weekly at 6 a.m., 12 noon and 6 p.m. for eight weeks. Data collected were subjected to completely randomized design and two way analysis of variance using SAS 2003 version 9.2. Significant differences where appropriate were determined using Duncan multiple range test (DMRT) of the same statistical package.

RESULTS AND DISCUSSION

Table 2 shows the average ambient, rectal and axillary temperature of layers fed varying levels of ASA.

The morning (MRT), afternoon (ART) and evening (ERT) rectal temperatures were significantly different between the two breeds of layers. The MRT, ART and ERT for Harco Black and Isa Brown were 41.35±0.03 °C versus 41.21 ±0.03 °C, 41.99 ±0.04 °C versus 41.75 ±0.03 °C and 41.65±0.03°C versus 41.60±0.03°C respectively. These values were however within the range of 40.6 – 43.0°C given as the normal temperature range for the domestic chicken (Robertshaw, 2004). There were also significant differences ($p<0.05$) in the evening axillary (EAXT) and evening rectal (ERT) temperatures of birds among the four treatment diets. The general trend was a decrease in the rectal and axillary temperatures with increase in the dietary levels of ASA. The inclusion of ASA in the diets of the experimental birds was able to reduce evening axillary temperature of the birds by 0.26°C (40.85°C-40.59°C) and evening rectal temperature by 0.18°C (41.72°C-41.54°C). These values are similar to the one reported by McDaniel and Parker (2004). The interaction between breeds and dietary levels of ASA showed that the Isa Brown breed had a better tolerance to heat stress and an equally better response to the ameliorative effect of dietary ASA.

The result of the weekly ambient, axillary and rectal temperature of the two breeds of layers fed varying level of ASA is shown in Table 3. Ambient temperature determines the other body temperatures as they both fluctuate with the ambient temperature (Sottnik, 2003). The lowest weekly ambient temperature was recorded in week 1 (27.44±1.72 °C), while the highest ambient temperature was recorded in week 6

(30.44 ±2.35 °C). The highest axillary temperature was observed in week 1 (40.84±0.24 °C) while the lowest axillary temperature was observed in week 3 (40.50±0.03 °C). Axillary temperature was lower than the rectal temperature and the difference between the two ranged from 0.62°C – 1.15°C as shown in Table 3.Depending on the ambient temperature. the rectal temperature of the birds under the present study was observably 0.89°C higher than the axillary temperature. Rectal temperature is therefore a more sensitive method of determining the core body temperature. That is why rectal thermometry is widely used in veterinary medicine and pediatrics (Sund-Levander *et al.*, 2002). The highest rectal temperature was recorded in week 2 (41.71±0.14 °C). Week 1 (41.46±0.16 °C) and week 8 (41.46±0.12 °C) had the lowest rectal temperatures.

CONCLUSION

It can be concluded that the rectal temperature proved a better method of taking the body temperature of the domestic chicken than the axillary temperature. Also, the lower body temperature of the Isa Brown breed in comparison with the Harco Black implied that the former is a better adapted breed to the high environmental temperature that subsists in the tropics. This experiment also confirmed the temperature lowering ability of ASA and its potency as an antipyretic drug. Its use as a veritable intervention tool against heat stress in tropical livestock should therefore be encouraged.

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Table 1: Gross composition (g/100g) of the experimental diets

Ingredients	T1	T2	T3	T4
Maize	50.00	50.00	50.00	50.00
Groundnut cake	6.50	6.50	6.50	6.50
Soybean meal	12.00	12.00	12.00	12.00
Palm kernel cake	3.50	3.50	3.50	3.50
Wheat offal	17	16.98	16.95	16.93
Fish meal	1.00	1.00	1.00	1.00
Bone meal	2.60	2.60	2.60	2.60
Limestone	6.50	6.50	6.50	6.50
Methionine	0.25	0.25	0.25	0.25
Lysine	0.10	0.10	0.10	0.10
Layers' Premix	0.25	0.25	0.25	0.25
Salt	0.30	0.30	0.30	0.30
ASA	0.00	0.025	0.050	0.075
Total	**100.00**	**100.00**	**100.00**	**100.00**
Calculated content				
Crude protein	16.70	16.70	16.70	16.70
ME (Kcal/kg)	2508	2508	2508	2508
Crude fibre	4.48	4.48	4.48	4.48
Calcium	3.32	3.32	3.32	3.32
Phosphorus	0.94	0.94	0.94	0.94

ASA = Acetyl salicylic acid; T1 = Diet with 0.00% ASA; T2 = Diet with 0.025% ASA; T3 = Diet with 0.050% ASA; T4 = Diet with 0.075% ASA

Table 2: Ambient, rectal and axillary temperature of layers fed varying level of ASA

Source of variation	MAT	AAT	EAT	MAXT	AAXT	EAXT	MRT	ART	ERT
Breed									
HB	25.50	31.75	30.08	40.30	41.11	40.71	41.35^{a}	41.99^{a}	41.65^{a}
IB	25.50	31.75	30.08	40.17	40.93	40.68	41.21^{b}	41.75^{b}	41.60^{b}
±SEM (Breed)	0.00	0.00	0.00	0.15	0.97	1.25	0.03	0.03	0.03
Levels of ASA									
0.00% ASA	25.50	31.75	30.08	40.20	41.01	40.85^{a}	41.25	41.90	41.72^{a}
0.025% ASA	25.50	31.75	30.08	40.19	40.99	40.73^{b}	41.26	41.81	41.67^{ab}
0.050% ASA	25.50	31.75	30.08	40.26	41.10	40.62^{c}	41.30	41.91	41.58^{ab}
0.075% ASA	25.50	31.75	30.08	40.27	40.97	40.59^{c}	41.32	41.85	41.54^{b}
±SEM (ASA level)	0.00	0.00	0.00	0.20	1.04	0.04	1.23	1.32	0.05
Breed x ASA level									
HB x 0.00%	25.50	31.75	30.08	40.31^{a}	41.01^{b}	40.85^{a}	41.36^{a}	41.95^{a}	41.68^{a}
IB x 0.00%	25.50	31.75	30.08	40.09^{d}	41.01^{b}	40.86^{a}	41.14^{c}	41.85^{b}	41.76^{a}
HB x 0.025%	25.50	31.75	30.08	40.22^{b}	41.15^{a}	40.75^{b}	41.35^{a}	41.97^{a}	41.73^{a}
IB X 0.025%	25.50	31.75	30.08	40.16^{c}	40.83^{c}	40.72^{b}	41.17^{c}	41.65^{d}	41.60^{b}
HB x 0.050	25.50	31.75	30.08	40.34^{a}	41.16^{a}	40.59^{d}	41.38^{a}	42.04^{a}	41.62^{b}
IB x 0.050%	25.50	31.75	30.08	40.19^{b}	41.05^{a}	40.65^{c}	41.23^{b}	41.79^{b}	41.54^{b}
HB x 0.075%	25.50	31.75	30.08	40.32^{a}	41.10^{a}	40.66^{c}	41.32^{a}	42.00^{a}	41.59^{b}
IB x 0.075%	25.50	31.75	30.08	40.23^{b}	40.84^{c}	40.52^{e}	41.32^{a}	41.71^{c}	41.50^{c}
±SEM Breed x ASA	0.00	0.00	0.00	0.04	0.06	0.05	0.03	0.02	0.05

a, ab, b, c, d, e = means on the same column but with different superscripts are statistically ($p<0.05$) significant, ASA = Acetyl salicylic acid

MAT = Morning Ambient Temperature, AAT = Afternoon Ambient Temperature; EAT = Evening Ambient Temperature, MAXT = Morning Axillary Temperature, AAXT = Afternoon Axillary Temperature, EAXT = Evening Axillary Temperature, MRT = Morning Rectal Temperature; ART = Afternoon Rectal Temperature, ERT = Evening Rectal Temperature T1 = 0.00% ASA; T2 = 0.025% ASA, T3 = 0.050% ASA; T4 = 0.075% ASA, SEM = Standard error of the mean

Table 3: Comparison between weekly ambient, axillary and rectal temperature of layers fed varying level of acetylsalicylic acid (ASA).

Week	Ambient(°C)	Axillary(°C)	Rectal(°C)	Difference (Rectal – Axillary)
1	27.44±1.72	40.84±0.24	41.46±0.16	0.62
2	28.11±2.11	40.58±0.26	41.71±0.14	1.13
3	29.11±2.16	40.50±0.30	41.65±0.17	1.15
4	29.99±1.91	40.64±0.27	41.69±0.23	1.05
5	29.78±1.66	40.71±0.25	41.62±0.19	0.91
6	30.44±2.35	40.78±0.23	41.59±0.21	0.81
7	28.44±1.94	40.62±0.17	41.54±0.15	0.92
8	29.56±1.63	40.55±0.19	41.46±0.12	0.91